

CHONDROCLADIA GIGANTEA (DEMOSPONGIAE) -
THE GIANT CLUBSPONGE OF THE NORTHEAST ATLANTIC

Chondrocladia gigantea is a most remarkable stalked sponge living on soft bottoms and attaining a height of 60 cm or more (Fig. 1). An elaborate branched "root"-system can reach 20 cm down into the bottom, anchoring the club-shaped sponge body, which is supported by a thick, spirally twisted stem of fibers of siliceous spicules and spongine. The surface of the sponge is velvetlike, light pink in life and has numerous longer or shorter papillae with spherical distal ends.

C. gigantea was first found by "The Norwegian North-Atlantic Expedition" (1876-1878) and described by Hansen (1885). Taken again by The Danish Ingolf Expedition 1895-96 and the Norwegian Michael Sars Expedition 1902, it was redescribed by Lundbeck (1905). Later, published and unpublished records have added substantially to the knowledge of its geographic and bathymetric distribution (Figs. 2, 3).

Most records are from the southern part of the Norwegian Sea and the Iceland Sea (the area between the island of Jan Mayen and Iceland), on the northern flank of the ridge from Scotland to Greenland. A single record south of the ridge, at 1960 m, is uncertain (Lundbeck 1905). Another well documented area is the Davis Strait and Baffin Bay (Brøndsted 1933). If it turns out that *C. gigantea* and *C. grandis* Verrill, 1879 are synonyms, a third area is off Nova Scotia. Three records are outside the mentioned areas; one is between Greenland and Svalbard (Koltun 1964), and two are in the Northwest Pacific, off Sakhalin and the Kuriles (Koltun 1958).

Koltun (1958, 1959) gave the bathymetric distribution as 238-615 m and 1450-2127 m. Because the 1450 m depth in the station list seems to be given as "970-1450 m" (Koltun 1964), his opinion about the distribution gap is not clear. The two Pacific records seem to have come from 200-400 m depth. In the deep interval four records are known of which the two deepest must be considered uncertain so far. One is referred to above (Lundbeck 1905, 1960 m), and the other is a small fragment from off the Norwegian coast (Hansen 1885, 2127 m). In the collections of the Zoological Museum, University of Copenhagen, there is a perfect specimen from 1600 m off West Greenland, and the fragmentary specimen taken deepest off Iceland originates from "860-1200 m". Our present records thus place the reliably known bathymetric distribution of *C. gigantea* from 240 to 1600 m, with the main occurrence between 500 and 1000 meters.

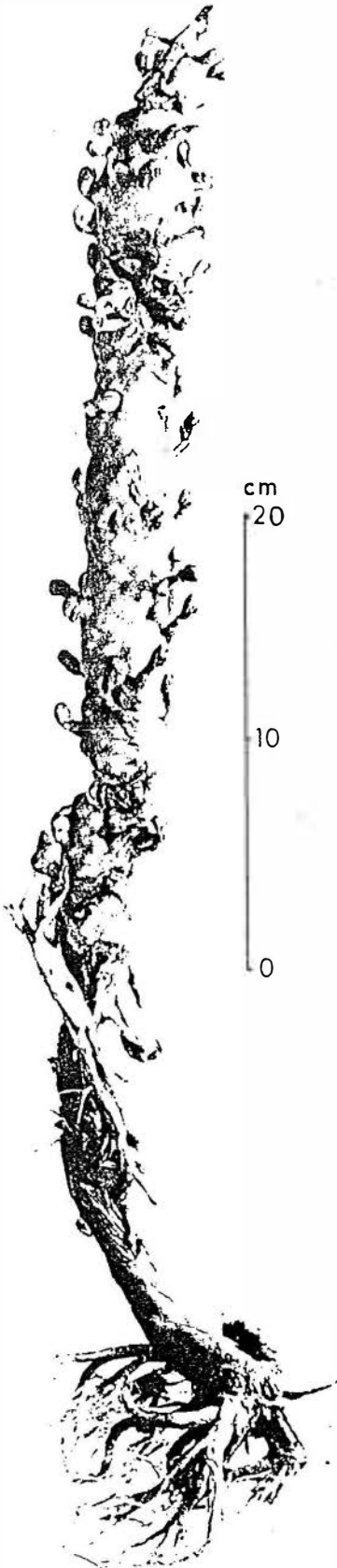


Fig. 1. *Chondrocladia gigantea* from 893 m depth, north of Iceland. The largest specimen ever recorded. BIOICE St. 2082. July 4, 1992.

The temperature range for the species, according to Koltun (1959), is $+0.66 - +2.7^{\circ}\text{C}$. However, these are the temperatures for the two Pacific records, and Koltun may have overlooked that Lundbeck (1905) concluded the main occurrence of *C. gigantea* to be in water of negative temperature, a matter further supported by the information given by Brøndsted (1933). All old and new records deeper than 500 m are from water of negative temperature ($-1.1^{\circ} - -0.3^{\circ}\text{C}$), except for the dubious one at 1960 m (3.1°C).

The shallowest record from West Greenland is at about 300 m depth with about 2°C , and another one is at 490 m with $+0.7^{\circ}\text{C}$. Off East Greenland there is one record at about 240 m at $0-1^{\circ}\text{C}$. North of Iceland the shallowest record is at 285 m with about 2°C , and on the top of the Iceland-Faroes Ridge there is one at 490 m with 2.5°C . The shallowest record from the Norwegian coast is at 669 m and -0.5°C . Thus, it seems possible that the upper distribution limit of *C. gigantea* is determined by temperatures of $2-3^{\circ}\text{C}$, the species accordingly occurring at shallower depths in West Greenland than off the Norwegian coast under the warm North Atlantic Current.

The lower distribution limit has another explanation than temperature. Judged from the distribution patterns (Fig. 2) it seems that at depths greater than about 1500 m the ecological niche occupied by a stalked, large,

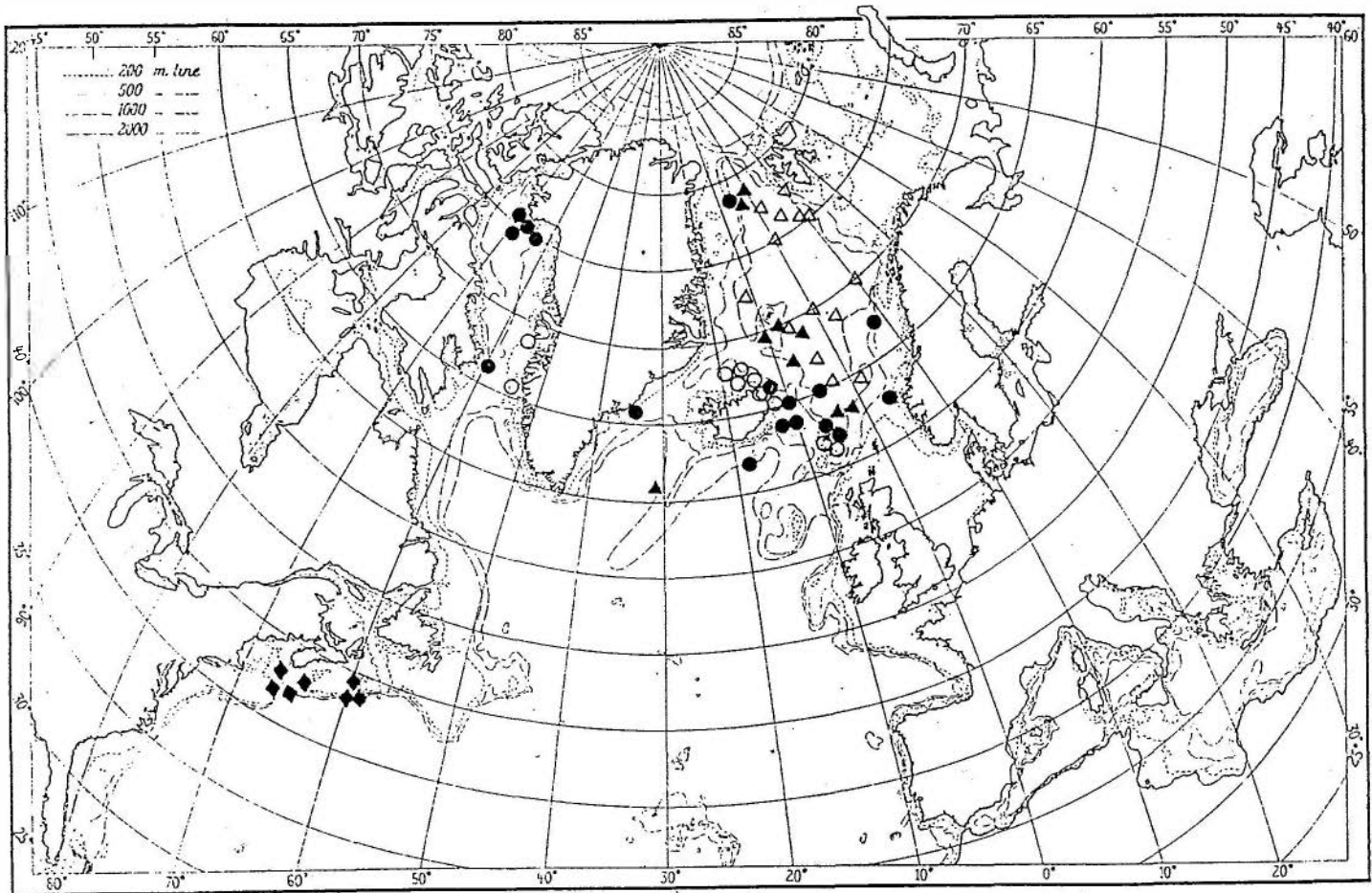


Fig. 2. The distribution of *Chondrocladia gigantea* and *Caulophacus arcticus*. Records are published by U.S. Comm. Fish. Fisheries (1882), Hansen (1885), Fristedt (1887), Lundbeck (1905), Topsent (1913), Burton (1928), Brøndsted (1933) and Koltun (1959, 1964, 1967). Unpublished records are from the Tjalfe Expedition 1908-1909, the NORBI Expedition 1975, the "Meteor" Cruise 13 (SFB 313) and cruises with the Faroese "Magnus Heinason" and the Norwegian "Håkon Mosby" around the Faroes and Iceland. Open symbols are unpublished records. Filled symbols are published records.

● *Chondrocladia gigantea* ◆ *Chondrocladia grandis* ▲ *Caulophacus arcticus*.

flat-bottom sponge in the Greenland and Norwegian Seas is taken over by the hexactinellid sponge *Caulophacus arcticus* (Hansen, 1885). This species attains stem lengths of more than 25 cm, and the body can be at least 15 cm in diameter, with the form of a mushroom, although with a somewhat folded edge. It lives at temperatures of -1.1 to $+0.4^{\circ}\text{C}$ (in a single case at 2.4°C), at 1450-4379 m (Koltun 1967). The change may be related to the lower sedimentation and food availability at great depths.

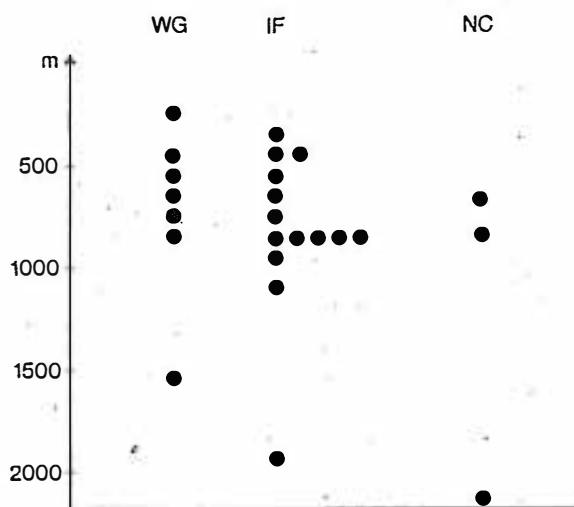


Fig. 3. The depth distribution of the records of *Chondrocladia gigantea* off West Greenland (WG), Iceland & the Faroes (IF) and the Norwegian coast (NC).

A number of problems concerning the morphology and biology of *C. gigantea* are tackled now as more material is collected during the ongoing BIOFAR and BIOICE programmes around the Faroes and Iceland:

1) Our present material partially supports the observation of Koltun (1959) that specimens from the lower end of the bathymetric range have short knoblike papillae, while specimens living at greater depths have long ones. We observe specimens with rather long papillae over the full depth range, while it seems that those with short ones

occur only in the shallower part. The condition does not seem to be size related.

2) Very large (up to 5 mm in diameter) "embryos" containing spicules were described by Lundbeck (1905). We only find them in some specimens, but there they often fill the interior of the sponge. So far they have been seen in material collected during May, June and July (different years).

3) According to Lundbeck (1905) the papillae may bear the oscules. We have the impression that, additionally, they may serve in asexual reproduction as buds, falling off and growing into small sponges. However, we lack the early stages of this process and will carry through a special search for them during future cruises.

Ole S. Tendal
Zoologisk Museum, København

Dagmar Barthel
Institut für Meereskunde, Kiel

References

- Brøndsted, H., 1933: The *Godthåb* Expedition 1928. Porifera. - Meddr. Grønland 79 (5): 1-25.
Burton, M., 1928: Hexactinellida. - Dan. Ingolf-Exped. VI, 4: 1-18.
Fristedt, K., 1887: Sponges from the Atlantic and Arctic oceans and the Bering Sea. - *Vega Expeditionens Vetensk. Iagttagelser* IV: 401-471.
Hansen, G.A., 1885: Spongidae. - Norw. North-Atlantic Exped. 1876-78. Christiania. 25 pp.
Koltun, V.M., 1958: Cornacuspongida from the Southern Kuriles and Southern Sakhalin. - *Issled. dolnevost. Mor. SSSR*. 5: 42-77 (In Russian).
- 1959: Cornacuspongida of the Northern and Far Eastern Seas of the USSR. - *Akademia NAUK*, 67: 1-227 (In Russian; translation 1971).

- 1964: Porifera. In "Scientific results in the higher latitudes. Oceanographic investigations in the northern part of the Greenland Sea and the adjacent Arctic basins". - Works from the Arctic and Antarctic Scientific Institute 259: 143-166 (In Russian).
- 1967: Hyalospongiae of the Northern and Far Eastern Seas of the USSR. - Akademia NAUK, 94: 1-125 (In Russian; translation 1967).
- Lundbeck, W., 1905: Porifera. Desmacidonidae (pars.). - Dan. Ingolf-Exped. VI, 2: 1-219.
- Topsent, E., 1913: Spongiaires provenant des Campagnes scientifiques de la *Princesse-Alice* dans les Mers du Nord. - Res. Camp. Sci. Albert I. Monaco XLV: 1-67.
- U.S. Comm. Fish. Fisheries, 1882: Report of the Commissioner. List of collections made by fishing vessels of Gloucester and other New England sea-ports for the United States Fish Commission. 7: 787-835.

- 1964: Porifera. In "Scientific results in the higher latitudes. Oceanographic investigations in the northern part of the Greenland Sea and the adjacent Arctic basins". - Works from the Arctic and Antarctic Scientific Institute 259: 143-166 (In Russian).
- 1967: Hyalospongiae of the Northern and Far Eastern Seas of the USSR. - Akademia NAUK, 94: 1-125 (In Russian; translation 1967).
- Lundbeck, W., 1905: Porifera. Desmacidonidae (pars.). - Dan. Ingolf-Exped. VI, 2: 1-219.
- Topsent, E., 1913: Spongiaires provenant des Campagnes scientifiques de la *Princesse-Alice* dans les Mers du Nord. - Res. Camp. Sci. Albert I. Monaco XLV: 1-67.
- U.S. Comm. Fish. Fisheries, 1882: Report of the Commissioner. List of collections made by fishing vessels of Gloucester and other New England sea-ports for the United States Fish Commission. 7: 787-835.